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Non extraction treatment of growing skeletal class II malocclusion with Forsus Fatigue Resistant Appliance- A Case Report

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Abstract
Objective: *To evaluate the treatment and post-treatment dentoskeletal effects induced by the Forsus device (FRD) in a growing patient with Class II malocclusion. A 13year old non-compliant male patient with Class II division1 malocclusion was treated with MBT 022in pre-adjusted edgewise appliance. After initial alignment and levelling, Forsus fixed functional appliance was placed and was continued for 6 months.*
Results: *At the end of the treatment there was significant reduction in overjet, overbite and correction of molar relationship. In sagittal plane, upper molar showed slight retrusive effect, upper incisors showed retroclination, mesialization of lower molars and lower incisor proclination were also seen. In vertical plane lower incisors showed intrusion and upper molars also showed some intrusion. Mandibular plane angle increased, convexity of profile improved, but less skeletal changes were seen.*
Conclusion: *The FRD protocol was effective in correcting Class II malocclusion skeletally but mainly at the dentoalveolar level.*
Keywords: *Class II malocclusion, Dentoskeletal, Forsus, MBT, Mandibular retrusion, FRD*

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I. Introduction

Class II malocclusion is one of the most frequent problems in orthodontics, as it affects one third of patients seeking orthodontic treatment[1]. Droschl found that the frequency of Class II malocclusions to be 37% among the children between 6 and 15 years of age. Although maxillary protrusion and mandibular retrusion are both found to be the possible causative factors, Mc Namara[2] reported that the most common component in a class II sample population is usually mandibular retrusion. Numerous orthodontic techniques and appliances have been introduced to treat Class II malocclusions, including intra-arch and inter-arch appliances, extra oral appliances, selective extraction patterns, and surgical repositioning of the jaws[3-6]. Thus, among the various orthodontic appliances introduced to treat Class II malocclusion, functional orthopedic appliances are widely used[7-10].Contrary to removable appliances, fixed devices do not require the patient's collaboration and can be worn in association with multi bracket therapy, so that Class II malocclusion can be corrected in a single phase treatment. Fixed functional appliances can be grouped into rigid or flexible devices[11]. The most commonly used rigid fixed functional appliances are the Herbst[12-15] and MARA[2,16-17]. Most popular flexible devices are the Jasper Jumper[4,18] EurekaSpring[5-6] and the Forsus device (FRD)[19–24.]

The FRD is a three-piece (L pin module) or two-piece (EZ2module) system, composed of a telescoping spring that attaches at the upper first molar and a push rod linked to the lower archwire, distal to either the canine or first premolar bracket. The appliance is relatively well accepted by patients who may experience some initial discomfort and functional limitations that generally diminish with time[24]. The dental, skeletal, and soft tissue short-term effects of comprehensive fixed appliance treatment combined with the FRD in Class II patients were evaluated previously[19–23].The current case discusses about a 13 year old non-compliant male patient with Class II division 1 malocclusion who was treated with Forsus fixed functional appliance.

Case Report

A male patient of age 13 years came to the Department of Orthodontics with the chief complaint of forwardly placed upper front teeth. He had a square, symmetrical face with decreased lower anterior facial height and potentially competent lips. A convex profile with posterior divergence, acute nasolabial angle and deep mentolabial sulcus was noted. He had class II molar relationship on right side and end on molar relation on left side, an overjet of 10mm and the overbite of 6mm, with the maxillary midline coincident and the mandibular midline deviated 1mm to the right of the facial centreline. Mild spacing in the upper arch and mild

crowding in the lower arch were recorded (Fig.1).The Cephalometric analysis revealed a skeletal class II relationship (ANB 6º) due to mandibular retrusion (SNA81º; SNB 75º). The mandibular plane angles (GoGn-SN 32º, FMA 28º), Y axis (69º) and lower facial height (48%) were indicating of hypodivergent face.

The patient was diagnosed as Angle's class II division 1 malocclusion on skeletal class II jaw base due to mandibular retrusion having hypodivergent growth pattern with deep overbite. The goal of orthodontic treatment was to correct skeletal jaw relation, to reduce the overjet & overbite and to correct the molar relationship to Class I on both sides using a non-extraction approach. The patient had history of orthodontic treatment and was non-compliant with removable appliance as reported by the parents. Hence, it was decided that bilateral Forsus Fatigue Resistant Device would provide the mechanics necessary to achieve our aims.

2.1 Extra-oral examination

The patient had an apparently symmetric face with mesoprosopic face form and potentially competent lips. On profile examination patient had a convex facial profile. The smile of the patient was symmetric and consonant with 100% maxillary incisor display on smiling (Fig.1).

The patient had positive VTO (Fig.2).

2.2 Intra-oral examination

Revealed primary second molar teeth in upper & lower arch with all other permanent teeth present till first molars. V shaped upper & U shaped lower arch. The gingival health was satisfactory. Class II molar relation on right side & end on molar relation on left side (Fig.3).

2.3 Functional examination

Patient showed normal speech pattern, oro-nasal breathing and a typical swallowing pattern. The path of closure of mandible was normal.

2.4 Examination of study casts

Showed apparently symmetrical arches with Class II molar relationship on right and end on molar relation on left side. There was 10mm overjet and 6mm overbite.

2.5 Cephalometric analysis

Revealed that patient was in CVMI stage IV (completion) and had Class II skeletal bases with low mandibular plane angle, proclined upper & lower incisors. The soft tissue analysis revealed protrusive upper lip and normal lower lip with an acute nasolabial angle (Fig.7).

2.6 Diagnosis

Angle`s Class II div1 subdivision malocclusion on skeletal class II jaw base with retrognathic mandible & horizontal growth pattern.

2.7 Problem List

Convex facial profile with incompetent lips
Skeletal Class II (due to retrognathic mandible)
Upper & lower incisor proclination
Increased overjet & overbite
Class II canine & molar relationship

2.8 Treatment Objectives

To improve facial profile
To correct proclination of upper & lower arch
To achieve normal overjet and overbite
To correct skeletal jaw relation, Class II canine & molar relationship

2.9 Treatment progress

An MBT 022in x 028in pre-adjusted edgewise appliance was bonded in upper and lower arch. An initial 0.014in round NiTi archwire was used for alignment and levelling of both arches for 4 weeks followed by 0.016in NiTi wire for one month. Two months later, upper and lower wires were replaced with 0.016in x 0.022in NiTi and 0.017in x 0.025in stainless steel wires. After initial alignment and levelling, labial root torque was given in lower 19in x 25in SS wire. After upper and lower arch consolidation, Forsus Fatigue Resistant Device was placed on both sides for a period of 6 months (Fig.4). The appliance was inserted from the mesial part of the head gear tube on the maxillary molar to the arch wire distal to mandibular canine. Finishing and detailing followed for 2 months after the molar correction. The total treatment duration was 19 months.

2.10 Retention

A removable Begg's wraparound retainer with anterior inclined plane in maxilla and Begg's wrap around retainer in mandible was used for 6 months to hold the corrected jaw relations.

2.11 Results

At the end of the treatment, patient had Class I molar relation with significant reduction in overjet and overbite (Table No.1), (Fig 6). In sagittal plane upper molar showed slight retrusive effect, upper incisors showed retroclination (1-NA), mesialization of lower molars and lower incisor proclination (1-NB) were also seen. In vertical plane, lower incisors and upper molars (U6-NF) showed some intrusion. Mandibular plane angle increased (Y axis, FMA) and convexity of profile improved but little skeletal changes were seen (Figure 7,8,9) (Table No.1).

Table 1: Cephalometric changes

Measurement		Steiner Ref Norm	Kerala Norm	Pre Trt.	Post Trt.	Diff.
SNA	(angle)	82^0	84.14^0	81°	80°	1°
SNB	(angle)	90^0	81.85^0	75°	78°	3°
ANB	(angle)	2^0	2.27^0	6°	2°	4°
1 to NA	(angle)	22^0	27.44°	38°	36°	-2°
□1 to NB	(angle)	25^0	30.75^0	31°	38°	7°
•1 to NB	(mm)	4 mm	7.5 mm	8mm	10mm	2mm
GoGn to SN	(angle)	32^0	27.91^0	32°	28°	4°
OTHER CRITERIA						
FMA	(angle)	25^0		28°	29°	1°
IMPA	(angle)	90 ± 5^0		104°	109 °	5°
WITS appraisal	(mm)	0/1 mm		10mm	-2mm	12mm
Ant. Face ht.	(mm)			120mm	123mm	3mm
Y axis		58.4^0	62^0	69°	69°	0°
Effective mand. Length				107mm	116mm	9mm
UFH:LFH				62:58	61:62	1:4
Nasion⊥ to Point A		0-1mm		-5mm	-8mm	-3mm
Nasion⊥ to Pog		-4 to 0 mm		-21mm	-16mm	5mm
U6-NF				24	23	1
L6-MP				32	34	-2

Soft Tissue Analysis: (Holdaway)

Particulars	**Mean**	**Pre trt**	**Post trt**
Facial Angle	90°	82°	85°
Nasolabial Angle	102 ± 8˚	82˚	100˚

II. Discussion

Only few studies evaluated treatment and post treatment effects induced by fixed rigid functional appliances[15-17], while no previous study assessed the post treatment effects of flexible appliances. In a recent study[24] it was reported that 87.9% of the patients were able to adapt to the FRD. In those patients who do not adapt to this appliance, treatment alternatives like Class II elastics can be taken into account[20]. In our case the effects seen were mostly dentoalveolar. These results were similar to those described by Franchiet al[21]. The FRD revealed to be an effective tool in inducing a significant dentoalveolar correction of Class II malocclusions. Significant decrease in both overjet and overbite were recorded (8mm and 4mm respectively), as well as a net improvement of the molar relationship (5 mm). The upper incisors exhibited a significant amount of retrusion (2°). The most relevant dental changes occurred in the lower arch with the lower incisors demonstrating significant protrusion (2mm) and a large amount of proclination (7°) (Table No.1). These results were similar to those reported by Baccetti et al[25] for the Herbst appliance, Siara-Olds et al[22] for the MARA, and Franchiet al[21]. A general overview of the outcomes of FRD in combination with fixed appliances revealed that main effects of this treatment are located at the dentoalveolar level, with significant corrections of overjet, overbite and molar relationship.

III. Conclusion

- The FRD protocol revealed to be effective in correcting Class II malocclusion mainly at the dentoalveolar level.
- Sagittal changes mainly seen were, lower incisor proclination, mesialization of lower molar, retrusive effect on upper incisors and molars.
- Vertical changes included, lower incisor and upper molar intrusion with increased mandibular plane angle.

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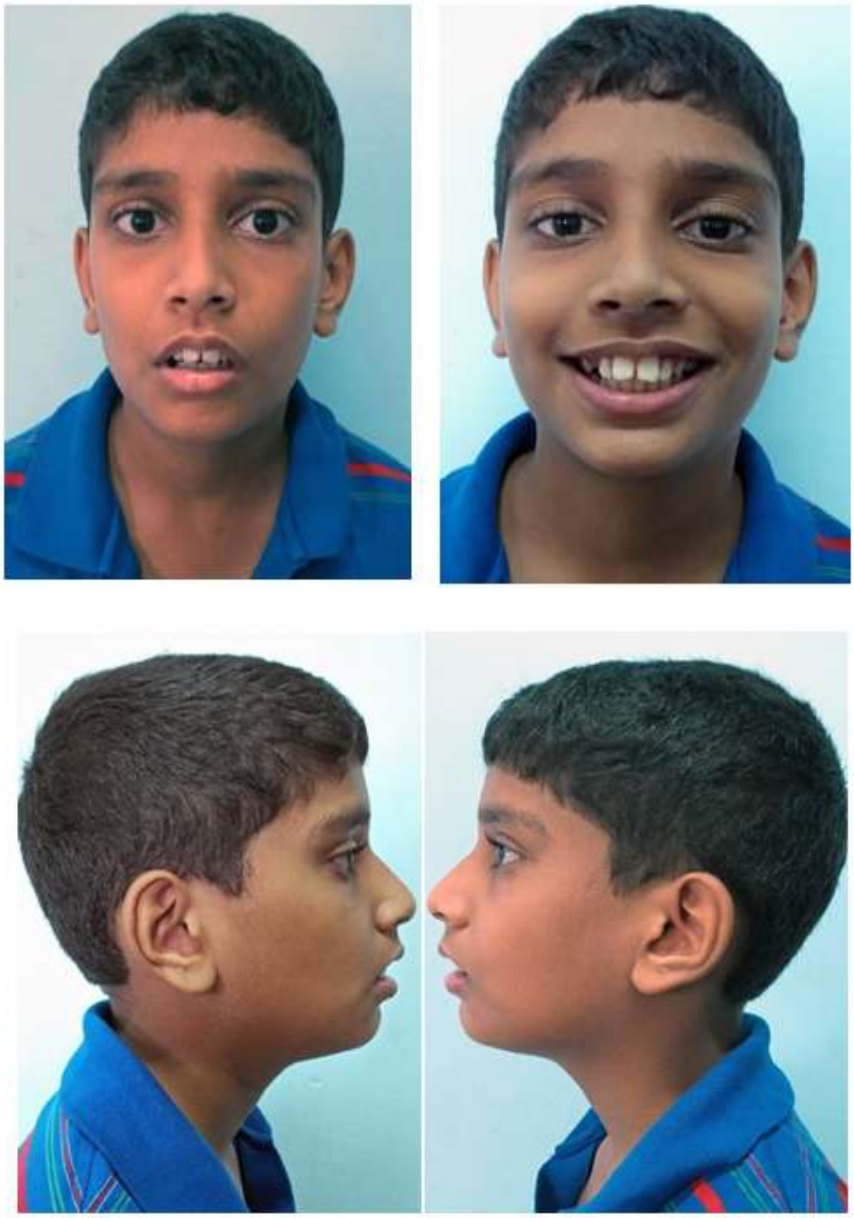

Figure 1: Pre-treatment extraoral

Figure 2: VTO

Figure 3: Pre-treatment intraoral

Figure 4: Forsus appliance

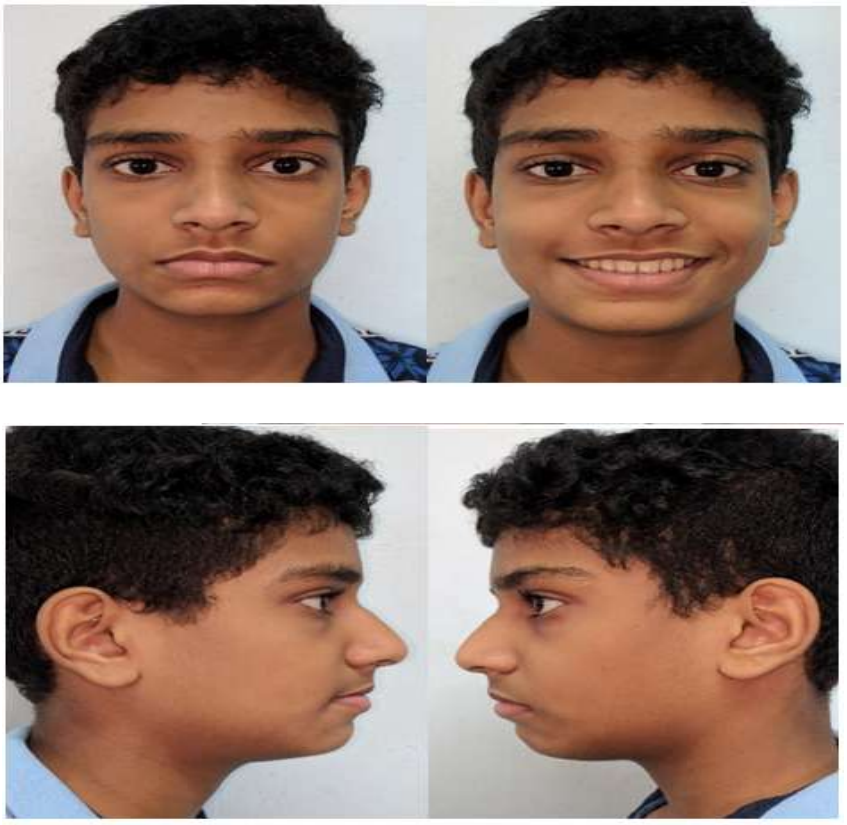

Figure 5: Post-treatment extraoral

Figure 6: Post-treatment intraoral

Figure 7: Pre-treatment cephalogram

Figure 8: Post-treatment cephalogram

Figure 9: Cephalometric superimposition

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